

ESA's NEO Coordination Centre

Current NEO statistics

C/2023 S3 (Lemmon) is a new near-Earth comet, only the second one found this year.

- Known NEOs: 33 655 asteroids and 122 comets
- NEOs in risk list*: 1563
- NEOs designated during last month: 287
- NEOs discovered since 1 January 2023: 2599

Focus on

The Yarkovsky effect is a non-gravitational force acting on small asteroids. The sunlight is absorbed by the asteroid surface and then re-emitted as heat, causing a tiny but continuous thrust that perturbs the orbit of the small body. This effect causes the semi-major axis of an NEA to drift, leading to potentially significant positional uncertainties over time. Understanding the Yarkovsky effect is important for accurate orbital predictions and assessing the potential impact hazard of NEAs. Recently, we introduced a new automated procedure for the detection of the Yarkovsky effect on NEAs, and updated the orbital data available on our portal. A detailed paper on it has been accepted in *Astronomy & Astrophysics*, with the [preprint available on arXiv](#).

Upcoming interesting close approaches

A large well-known asteroid will have a moderately close approach in December.

- (139622) 2001 QQ142 is a large and well-known 700-metre asteroid that will have a moderately close approach with Earth on 6 December. At the time of its closest approach, it will be about 5.5 million km away, reaching magnitude 14.
- 2020 YO3 is a small Tunguska-sized asteroid that will probably come close to the Earth at the end of December. Its exact approach distance is unknown, since the object has not been observed since 2021, but it cannot be closer than 200 000 km.

Recent interesting close approaches

Four objects were discovered while coming closer than the GEO ring this month.

- For the first time ever, in November, four known asteroids (2023 VA, 2023 WA, 2023 VB2 and 2023 VE1) came closer to Earth than the Geostationary orbit during a single month. They were all very small, with a diameter of less than 10 metres, and their approach distances ranged from 26 000 km to 35 000 km. Close approaches of small objects at these distances are quite common, but they often go unnoticed. Finding four in a single month shows that our survey and follow-up capabilities have dramatically improved over the past few years.

News from the risk list

A few updates at the top of our risk list.

- 2023 TL4 has remained at the top of our risk list, despite new observations, and it still ranks at level 1 on the Torino Scale. Further observations will be possible during the next few weeks, and may lead to a revision of the impact threat.
- 2023 VD3 and 2023 VH6 are much smaller objects that also earned top-10 spots.
- 2023 TB2, on the other hand, has been downgraded to much lower threat levels thanks to observations obtained with Spain's Gran Telescopio Canarias.

*The risk list of all known objects with a non-zero (although usually very low) impact probability can be found at <https://neo.ssa.esa.int/risk-list>

In other news

- The location and dates for the next IAA Planetary Defense Conference (PDC) have been announced. It will be held in Stellenbosch, South Africa, on 5-9 May 2025.

Upcoming events

- 55th Lunar and Planetary Science Conference (LPSC 2024), 11-15 March 2024, The Woodlands, USA
<https://www.hou.usra.edu/meetings/lpsc2024/>
- Apophis T-5 Years, 22-23 April 2024, Noordwijk, The Netherlands
<https://www.hou.usra.edu/meetings/apophis2024/>
- Follow-up Observations of Small Bodies in the Solar System in the Era of Large Discovery Surveys, 6 and 8 August 2024, Cape Town, South Africa
<https://sbss2024.saa.ac.za/>

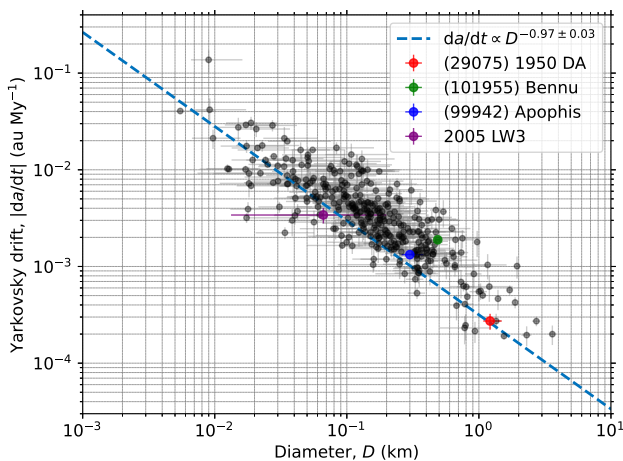
Number of known close approaches per year

The table shows the total number of known close approaches in the past 10 years, both within the traditional threshold of 0.05 au and within the height of the Geostationary ring.

The total number of close approaches is expected to remain relatively constant, while the number of known approaches is rising, highlighting our continuous advancement in NEO discovery and follow-up.

Notably, the number of very close approaches is increasing at a faster rate than the overall total. This is likely due to the heightened focus on small impactors, supported by new alert systems such as ESA's Meerkat and JPL's Scout.

Year	Number below the GEO ring	Number below 0.05 au
2014	3	2332
2015	3	2327
2016	6	2687
2017	4	2784
2018	6	2946
2019	5	3234
2020	7	3769
2021	11	3887
2022	12	3999
2023 (to date)	9	3561



Our automated procedure found 348 NEAs for which the Yarkovsky effect is measurable. The primary outcome of the Yarkovsky effect is a drift in semi-major axis. The figure shows the measured semi-major axis drift vs. the diameter of the object of all our detections. The magnitude of the drift is inversely proportional to the diameter of the asteroid, as can be seen from the fit depicted by the blue dashed line.

Among the positive detections, we can find (101955) Benu, (99942) Apophis, (29075) 1950 DA, and 2005 LW₃ (the target of the most recent IAWN timing campaign).

[Credit: ESA / PDO]

Links for more information

Website: <https://neo.ssa.esa.int>

Close approaches page: <https://neo.ssa.esa.int/close-approaches>

Risk List: <https://neo.ssa.esa.int/risk-list>

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